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Magnification also depends, of course, upon the distance of mirror from the lens.

The apparatus has been especially helpful in making rapidly, and to scale, accurate drawings of insect wings, mouth-parts and the like. One student, who was also working in vertebrate zoology, found it of the greatest service in making from negatives enlarged drawings of the arrangement and distribution of the scales of various reptiles. But in addition to this outline work it is also perfectly feasible to use it with more detailed drawings from microscopic preparations if the room be well darkened. It is quite possible that a similar device has long been in use by others, but I have failed to find any mention of it and I have, therefore, thought that this description might be of aid to some.

WM. A. RILEY

#### SOCIETIES AND ACADEMIES

##### THE PHILOSOPHICAL SOCIETY OF WASHINGTON

THE 655th meeting was held November 21, 1908, President Bauer in the chair. Three papers were read at this meeting, as follows:

*The Radiation Laws of Metals:* W. W. COBLENTZ.

A knowledge of the laws governing the radiation of metals with variation in temperature is of interest in connection with the numerous speculations offered to explain the great light emissivity, *i. e.*, the high luminous efficiency of the new incandescent lamps with metal filaments.

The speaker described some results obtained in an investigation of the most important so-called constant,  $\alpha$ , of the type which obtains for a "black body" in which  $\alpha - 1 = 4$ , in Stefan's law of total radiation. The substances examined were tungsten, tantalum, osmium, platinum and several types of carbon filaments, usually in the form of 110-volt incandescent lamps. The spectral distribution of energy was measured with a bolometer.

It was found that the so-called constant,  $\alpha$ , decreased with rise in temperature, and in all cases higher in value than that of platinum.

It seems to be a physical property of metals to have a low reflecting power in the visible, and especially in the ultra-violet, part of the spectrum. Throughout the infra-red the reflecting power of metals is uniformly high. The low reflecting power in the visible spectrum causes an abnormally high emission in this region, which, in con-

nection with the high values of the so-called constant,  $\alpha$ , accounts for the high luminous efficiency.

Although it seems to have been overlooked heretofore, it is obvious that the so-called constant,  $\alpha$ , must decrease in value and approach that of a "black body," otherwise a point would be attainable at which the radiation is greater than that of a black body at the same temperature.

From the results obtained it is evident that the spectral emissivity function of metals must be far more complex than that given in the Wien equation. Since the emissivity is a function of the reflecting power, which is a function of the refractive index and of the absorptive coefficient, which, in turn, are functions of the temperature, the wave-length and the electrical conductivity, it is evident that the spectral emissivity equations must contain factors which will take account of these phenomena.

*Determination of Flexure of Pendulum Supports by the Interferometer:* W. H. BURGER.

In measuring the force of gravity by means of a swinging pendulum, the observations are necessarily made under varying conditions, and the period of vibration of the pendulum is consequently affected by many causes, and corrections have to be applied before the value of  $g$  can be ascertained. One of the important corrections results from the elastic yielding of the pendulum support. Several methods have been used to measure the flexure of the pendulum support and to ascertain its effect upon the period of the oscillating pendulum. Each of these methods contains some doubtful assumptions, and to avoid which the new plan of employing the interferometer for measuring the absolute displacement due to flexure of pendulum support was devised by Messrs. Hayford and Fischer, of the Coast and Geodetic Survey. The instrument used is a modified form of the Michelson interferometer. In observing, the instrument is separated into two parts, the main body of the instrument, and the mirror attached to the pendulum case, each being carried on entirely separate supports.

The experiments carried out by the speaker included tests of flexure of both pendulum case and of the pier upon which the case was mounted. The displacements were found to be movements of rotation. For comparison the static force method was also used in the experiments. Measurements of displacement were made with the pendulum case mounted with various substances between the

foot plates and pier. The investigations with the interferometer are still in progress, but it was the speaker's belief that the results so far attained should show that a distinct advance will be made in gravity observations when the flexure is determined by means of the interferometer.

*Construction of Scientific Instruments and Their Adjustment:* F. E. WRIGHT.

The paper dealt with the importance to science of knowing the degree of accuracy of scientific results, and the influence which the construction of the instrument may exercise in scientific investigation.

Under the head of informal communications, W. J. Humphreys spoke of the possible magnetic effect on the earth of wind storms, and of the recent discoveries made at Mt. Wilson regarding sun-spots.

R. L. FARIS,  
*Secretary*

THE NEW YORK ACADEMY OF SCIENCES. SECTION  
OF ASTRONOMY, PHYSICS AND CHEMISTRY

At a meeting held on November 16 at the American Museum of Natural History Professor D. W. Hering was nominated for chairman of the section and a vice-president of the society for the ensuing year. Professor Wm. Campbell was re-elected secretary. The following papers were then presented:

*On the Electrolytic Refining of Iron:* E. F. KERN.

The previous work on this subject was reviewed; first, electroplating iron upon the surface of engraved copper plates to obtain a hard facing; then the work of Burgess and Hambueschen, of Gee, of Neuburger and von Klobukow, of Skrabel, of Maximowitsch and of Cowper-Coles. The electrolytes which have been most generally used are neutral solutions of ferrous sulphate or ferrous chloride containing respectively the sulphates or chlorides of ammonium. Smoother deposits were obtained by the presence of magnesium sulphate in an electrolyte of ferrous ammonium sulphate; by stirring the electrolyte; at a temperature of 60–70° C. Oxidation retarded by addition of glycerine. Precipitation of basic salts prevented by adding just sufficient acid to clear the solution. The iron deposited was a hard, brittle, crystalline mass, over 99.9 per cent. pure.

From experiments carried on in the department of metallurgy, Columbia University, it was found that neutral ferrous fluosilicate electrolytes are not suitable, as they are slowly decomposed with the separation out of silica.

Good deposits were obtained from neutral electrolytes containing either 8 per cent. iron, as  $\text{FeSO}_4$ , or 6 per cent. iron and 3 per cent. sodium, as sulphates, or 8 per cent. iron and 4 per cent. sodium, as chlorides. With a current density of 10 to 20 amperes per square foot and a temperature of 50° C., the electromotive force for the first solution was 0.8 to 0.95 volt, for the second 0.5 to 0.85 volt, for the third 0.4 to 0.5 volt. The paper concluded with a discussion of the costs of electrolytic refining of iron.

W. Campbell read a paper on the "Use of Metallography in Certain Problems in Concentration." The unsuccessful attempts to concentrate the nickel in nickeliferous pyrrhotites were probably due to the fine condition of the pentlandite. Slides illustrating the structure of ores from different localities were shown. The structure of certain magnetic lead ores from Idaho was seen to be a fine-grained complex containing magnetite, quartz, calcite and other gangue, blende and galena, which were deposited in about that order. Magnetic separators applied to the zinc-lead middlings from the jigs yielded a lead-rich concentrate which was taken out by the magnets. The structure of a zinc ore at ground-water level, from New Mexico, was shown to be mainly rosettes and compact masses of specular hematite with zinc blende in the interstitial spaces. The following order was indicated: pyrite, hematite, chalcopyrite, blende and a little gangue. The difficulty in concentrating the zinc was due in part to structure.

W. Campbell read some notes on a "Visit to the Collieries and Iron and Steel Plants of Nova Scotia," illustrated by numerous lantern slides. The visit was made with the Canadian Mining Institute during the summer. The collieries of the Dominion Coal Company at Glace Bay were first seen, then the plant of the Dominion Iron and Steel Company. Piers with mechanical unloaders for ore from Newfoundland; four blast furnaces; ore beds for winter stock, blowing engines, etc.; two Bessemer converters, ten open-hearth furnaces; rail mill, rod mill; coke ovens and coal-washing plant. At North Sydney the Nova Scotia Steel and Coal Company has coal and ore piers, with two steam Wellman Seaver Morgan ore unloading cranes. Wabana ore from Bell Island, Newfoundland, averages 55 per cent. Fe. At Sydney mines the various collieries were visited. Here are coke ovens and coal washer, one blast furnace (200 tons a day), three forty-ton basic open-hearth furnaces and one rolling furnace of

180 tons used as mixer. Ingots are sent to the rolling mills at New Glasgow.

WILLIAM CAMPBELL,  
*Secretary*

COLUMBIA UNIVERSITY,  
NEW YORK

THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND  
MEDICINE

THE thirtieth meeting of the society was held at the College of Physicians and Surgeons, October 21, 1908, with President Lee in the chair.

*Members present:* Alsberg, Atkinson, Auer, Banzhaf, Burton-Opitz, Crile, Dakin, Ewing, Famulener, Flexner, Gies, Harris, Jobling, Joseph, Kast, Lee, Levene, Levin, Lusk, Mandel (A. R.), Meltzer, Meyer, Morgan, Noguchi, Opie, Park, Pearce, Shaffer, Terry, Van Slyke, Weil, Wells, Wolf.

*Members elected:* C. C. Guthrie, E. P. Lyon and Mazyek P. Ravenel.

*Scientific Program*<sup>1</sup>

"Studies on the Chemistry of Anaphylaxis," H. Gideon Wells.

"Further Observations on the Clinical Aspects of Hemolysis," George W. Crile.

"The Behavior of Alanin in Metabolism," A. I. Ringer and Graham Lusk.

"An Important Source of Error in Heller's Test for Urinary Protein," William Weinberger (by invitation).

"A Clamp for Direct Transfusion of Blood" (a demonstration), Isaac Levin.

"The Further Separation of Antitoxin from its Associated Protein in Horse Serum," Edwin J. Banzhaf.

"Multiple Tumors in Mice," J. W. Jobling.

"On Plastein," D. D. Van Slyke and P. A. Levene.

"The Action of Bile and Some of its Constituents upon Intestinal Peristalsis and the Circulation," Isaac Ott and John C. Scott.

"The Uric Acid Excretion of Normal Men," Paul J. Hanzlik and Philip B. Hawk.

"Hemolysins in the Sera of Carcinoma and Syphilis," S. Peskind (by invitation).

<sup>1</sup>Authors' abstracts of the papers read before the Society for Experimental Biology and Medicine are published in the *Proceedings of the Society for Experimental Biology and Medicine*. A number is issued shortly after each meeting, and costs twenty cents a copy. Copies may be obtained from the managing editor, William J. Gies, 437 West 59th Street, New York.

"The Effect of Instilling Adrenalin Chloride into the Mammalian Eye," W. H. Schultz (by invitation).

"Successful Canine Infection with Cultures of *Leishmania infantum* (Ch. Nicolle)," Frederick G. Novy.

"New Apparatus for Use in Metabolism Work" (a demonstration), William J. Gies.

WILLIAM J. GIES,  
*Secretary*

THE BIOLOGICAL SECTION OF THE ACADEMY OF  
SCIENCE AND ART OF PITTSBURG

At a regular meeting of the section on December 1, Mr Richard R. Hice, of Beaver, Pa., spoke on the "Preglacial Drainage of Western Pennsylvania." Mr. Hice gave a concise summary of the work of Carll, White, Foshay, Jillson, Leverett, Campbell and Hice on the drainage of this part of the state. As outlined by him, the history of the region has been as follows: In the late Tertiary there existed a fairly well-developed river system draining northward into the Erie basin through the upper Ohio and Beaver valleys. This system was destroyed by the advance of the Kansan ice, which dammed the rivers, forming Lake Monongahela. The water was thus raised to such a height that it spilled over the divide below Wheeling, and the formation of the present Ohio was begun. A period of uplift followed, during which the rivers draining toward the southwest cut their channels far below the present level of the river bottoms. During the later part of the Wisconsin ice-advance and following the retreat of the ice, there was a settling of the land and the valleys were filled to a point above the present stream level with glacial debris. At the present time the streams are engaged in lowering their beds in these sands and gravels.

PERCY E. RAYMOND,  
*Secretary*

THE ELISHA MITCHELL SCIENTIFIC SOCIETY OF THE  
UNIVERSITY OF NORTH CAROLINA

THE 180th meeting of the society was held in Chemistry Hall on Tuesday, November 10, 1908, 7:30 P.M. The program was as follows:

"A Trip to Europe for Geographical Study" (illustrated with lantern slides), Professor Collier Cobb.

"A Rapid Method for Determination of Oil in Cotton-seed Products," Professor Chas. H. Herty.

ALVIN S. WHEELER,  
*Recording Secretary*